



FCC Test Report

Model Name: CDMA Radio Frequency Unit

Model Number: CRFU-AWS

Report No: SYBH (R) 050102008EB-1
FCC ID: QISCRFU-AWS

Reliability Laboratory of Huawei Technologies Co., Ltd.

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

Tel: +86 755 28780808 Fax: +86 755 89652518

Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has obtained the accreditation of THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION (A2LA), and Accreditation Council Certificate Number: 2174.01.
3. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
4. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-1.
5. The laboratory also has been listed by the VCCI to perform EMC measurements. The accreditation number is R2364, C2583, and T256.
6. The test report is invalid if not marked with "exclusive stamp for the test report".
7. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
8. The test report is invalid if there is any evidence of erasure and/or falsification.
9. If there is any dissidence for the test report, please file objection to the test centre within 15 days from the date of receiving the test report.
10. Normally, the test report is only responsible for the samples that have undergone the test.
11. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the laboratory.
12. In this page, the "laboratory" is "Reliability Laboratory of Huawei Technologies Co., Ltd."



REPORT ON

FCC Test of Huawei CDMA Radio Frequency Unit

Report No: SYBH (R) 050102008EB-1

FCC ID: QISCRFU-AWS

REGULATION

47 CFR FCC Part 2, Subpart J
47 CFR FCC Part 27, Subpart C & L

CONCLUSION

PASSED

General Manager

2008-11-18
Date (y-m-d)

张兴海
Name

**Technical Responsibility
For Area of Testing**

2008-11-18
Date (y-m-d)

胡俊
Name

胡俊
Signature

Test Lab Engineer

2008-11-18
Date (y-m-d)

梁昌冠
Name

梁昌冠
Signature



Contents

1	<u>Summary</u>	5
2	<u>Product Description</u>	6
2.1	Production Information of the Equipment under Test (EUT)	6
2.2	Modification Information	6
3	<u>Test Site Description</u>	8
3.1	Testing Period	8
3.2	Applied Standards	9
4	<u>Product Description</u>	10
4.1	Technical Characteristics	10
4.2	EUT Identification List	12
5	<u>Main Test Instruments</u>	13
6	<u>Transmitter Measurements</u>	14
6.1	Maximum Channel Power	15
6.2	Modulation Characteristics	19
6.3	Occupied Bandwidth	22
6.4	Band Edges Compliance	25
6.5	Spurious Emission at Antenna Terminal	28
6.6	Radiated Spurious Emission	32
6.7	Frequency Stability	36
7	<u>System Measurement Uncertainty</u>	39
8	<u>Appendices</u>	40



1 Summary

The table below summarizes the measurements and results for the equipment of CRFU-AWS. Detailed results and descriptions are shown in the following pages.

table 1. Summary of results for FCC requirements for AWS Band

47 CFR FCC Part(s) Requirements		Description	Result
Specification	Limits		
2.1046	27.50(d)	Maximum Channel Power	PASS
2.1047	-	Modulation Characteristics	PASS
2.1049	-	Occupied Bandwidth	PASS
2.1051	27.53(g)	Band Edges Compliance	PASS
2.1051	27.53(g)	Spurious Emission at Antenna Terminal	PASS
2.1053	27.53(g)	Radiated Spurious Emission	PASS
2.1055	27.54	Frequency Stability	PASS

Note1: If no limits were applied, limits for product standards may be employed in the present test report.

2 Product Description

2.1 Production Information of the Equipment under Test (EUT)

2.1.1 General Description

This describes the logical structure of the BTS. Logically, the BTS consists of the baseband system, RF system, power system, and antenna system.

Baseband System

The baseband system consists mainly of BBU3900s and performs the following functions:
Providing the physical interface for data exchange between the BTS and the BSC
Modulating and demodulating baseband data and CDMA channel signals
providing system synchronization clock signals
Implementing resource management, operation and maintenance, and environment monitoring

RF System

The RF system consists mainly of CRFU and performs the following functions: on the forward links, implementing up-conversion and power amplification for modulated transmitted signals and filtering the transmitted signals to make them meet the requirements of the Um interface protocol on the reverse link, filtering the signals received by the antenna to suppress out-band, interference and performing low noise amplification, channel division, down-conversion, and channel-selective filtering

Power Supply System

The power supply system consists mainly of DC DU and performs the following functions: The DCDU is a DC power distribution unit and provides -48 V DC power input for the components in the cabinet.

Antenna System

The antenna system consists of the RF antenna system and satellite antenna system. The antenna system performs the following functions:

Satellite antenna system

Through the satellite synchronization antenna, the BTS receives signals from the GPS or GLONASS system and performs wireless synchronization.

RF antenna system

The RF antenna system transmits modulated RF signals and receives the signals from the MS.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

table 2. Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Remark(Note)
CDMA 1x	Modulation: BPSK,QPSK RC1&RC3	TM1	
1x Ev-DO	Modulation: 16QAM	TM2	

2.2 Modification Information

For original equipment, following table is not application.

table 3. Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
--------------	--------------	------------------	-------------	--------------------



Not applicable				

3 Test Site Description

The test site of:

***Huawei Technologies Co. Ltd.
P.O. Box 518129
Huawei base, bantian,
Longgang District, Shenzhen, China***

3.1 Testing Period

The test has been performed during the period of

Date of Start: 05 November 2008
Date of End: 17 November 2008

3.2 Applied Standards

table 4. Applied Standard

Standards Name	Standards Description
47 CFR Part 2 (10-1-05 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
47 CFR Part 27 (10-1-06 Edition)	Miscellaneous Wireless Communications Services

table 5. Test Method

Standards Name	Standards Description
EIA/TIA-102-CAAA:1999	Digital C4FM/CQPSK Transceiver Measurement Methods (ANSI/TIA/EIA-102.CAAA-1999)
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ITU-R Recommendation SM.329-10 (2003)	Unwanted emissions in the spurious domain
3GPP2 C.S0010-B	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations. Release B
3GPP2 C.S0032-0	Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Network
3GPP2 C.S0057-B	Band Class Specification for cdma2000 Spread Spectrum Systems

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

table 6. Frequency Range for AWS Band

☒ FDD ☐ TDD	Center Frequency Range	Frequency Block Range
Uplink band:	Uplink band (RX):	1710 to 1755 MHz
Downlink band:	Downlink band (TX):	2110 to 2155 MHz

4.1.2 Channel Separation/Bandwidth

table 7. Frequency Interval and Channel Separation for AWS Band

Frequency interval:	50 kHz
Channel separation/bandwidth:	1.25 MHz

4.1.3 Type of Emission

Refer to FCC part 2.201 and 2.202..

table 8. Type of Emission

Emission Designation:	1M25F9W
-----------------------	---------

4.1.4 Environmental Requirements

table 9. Environmental Requirements

Minimum temperature:	-40 °C
Maximum temperature:	+52 °C
Relative Humidity:	5% to 95% RH

4.1.5 Power Source DC Power Source

DC voltage nominal:	=== -48 V
DC voltage range:	=== -60 V to === -37 V
DC current maximal:	70 A

4.1.6 Tune-up Procedure

Refer to FCC 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.



4.2 EUT Identification List

4.2.1 Component Parts Information

table 10. Component Parts Information

Model Name	Qty.	H/W Ver.	S/W Ver.	Description	Serial Number
BBU3900	1	VER.F	V400R006C05	Baseband Processing Unit	21023161761087000013
CRFU	2	VER.E	V400R006C05	Multi-Carrier Transceiver Unit	2102316407108A000007 2102316407108A000005
FAN	1	VER.C	N/A	Fan Unit	2102120463P085000060
DCDU	1	VER.E	N/A	DC Power Distribution Unit	2102120457P085000127

4.2.2 Adapter Technical Data

Not Applicable

4.2.3 Battery Technical Data

Not Applicable

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: CRFU-AWS
FCC Identification: QIS CRFU-AWS

5 Main Test Instruments

table 11. Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (y-m-d)
Signal Generator	R&S	SMR 40	100325	2009-05-12
Signal Generator	R&S	SMU200A	100699	2009-01-13
Signal Analyzer	R&S	FSQ 40	100025	2009-10-05
EMI Test receiver	R&S	ESMI	829179/008	2009-05-12
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	2009-08-21
Power amplifier	Agilent	8447D	2944A10146	2009-05-12
Power amplifier	Agilent	8447D	2944A10174	2009-05-12
Horn Antenna	ETS	3160-9	00060008	2009-08-18
Horn Antenna	ETS	3117	00062549	2009-08-10
Climate Chamber	Envirotronics	WPH-3	10066625	2009-10-08



6 Transmitter Measurements

For tests in this section, typical operating frequency points (channels) were used, which include bottom/lowest channel (B), middle channel (M) and top/highest channel (T) of each frequency block as the table below. Unless otherwise stated, all tested frequency points were employed to perform tests.

table 12. Frequency points (channels) selected to perform tests

Operating Band	Multi-Carriers	Channels No.		
		Channel B	Channel M	Channel T
AWS band:	1	No.25 2111.25MHz	No.450 2132.5MHz	No .875 2153.75MHz
AWS band:	2	No.25/50 2111.25/2112.5MHz	No.450/475 2132.5/2133.75MHz	No .875/850 2153.75/2152.5MHz
AWS band:	3	No.25/50/75 2111.25/2112.5/ 2113.75MHz	No.425/450/475 2131.25/2132.5/ 2133.75MHz	No .875/850/825 2153.75/2152.5/ 2151.25MHz
AWS band:	4	No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz	No.400/425/450/475 2130/2131.25/ 2132.5/2133.75MHz	No.875/850/825/800 2153.75/2152.5/ 2151.25/2150 MHz

6.1 Maximum Channel Power

6.1.1 Test Conditions

table 13. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature (+15 °C to +35 °C):	19 °C
Relative humidity (45 % to 85 %):	74 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Aws Band: B, M, T Multi Carriers: 1, 2, 3, 4, TM1, TM2

6.1.2 Test Specifications and Limits

Compliance with FCC part 2.1046 and part 27.50(d), the power of base station transmitting in the 2110-2155 MHz band is limited to a peak EIRP of 1640 watts.

table 14. FCC Limits for AWS Band

Maximum Output Power	< 1640 Watts (=62 dBm)
----------------------	------------------------

6.1.3 Test Method and Setup

The EUT (CRFU-AWS) was connected to the Wireless Signal Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Maximum Channel Power of the EUT by the R&S FSQ40.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Before the test, (1) For CDMA2000 1X system, set the EUT/BTS to transmit a signal modulated with a combination of Pilot, Sync, Paging, and 6 traffic channels; (2) For CDMA2000 1X EV-DO system, configure the MAC channel with 14 MAC indices, i.e. the RA channel and 13 RPC channels.

Test setup

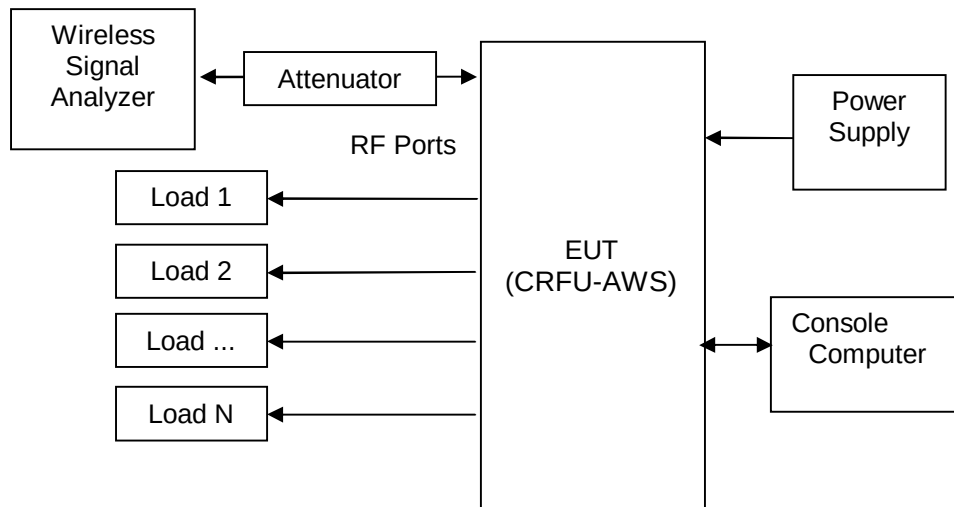


Figure 1. TEST SETUP

6.1.4 Measurement Results

(1) TM1: CDMA 1X

(a) Single Carrier

table 15. Measurement Output Power for single carrier

Maximum Output Power (dBm)					
Channel B No.25 2111.25MHz		Channel M No.450 2132.5MHz		Channel T No .875 2153.75MHz	
Measured	Limit	Measured	Limit	Measured	Limit
43.09	< 62	43.48	< 62	43.17	< 62

(b)Two Carriers

table 16. Measurement Output Power for two carriers

Maximum Output Power (dBm)					
Channel B No.25/50 2111.25/2112.5MHz		Channel M No.450/475 2132.5/2133.75MHz		Channel T No .875/850 2153.75/2152.5MHz	
Measured	Limit	Measured	Limit	Measured	Limit
46.23	< 62	46.07	< 62	46.48	< 62

(c) Three Carriers

table 17. Measurement Output Power for three carriers

Maximum Output Power (dBm)		
Channel B	Channel M	Channel T



No.25/50/75 2111.25/2112.5/ 2113.75MHz		No.425/450/475 2131.25/2132.5/ 2133.75MHz		No .875/850/825 2153.75/2152.5/ 2151.25MHz	
Measured	Limit(dBm)	Measured	Limit	Measured	Limit
48.35	< 62	48.16	< 62	48.19	< 62

(d) Four Carriers

table 18. Measurement Output Power for four carriers

Maximum Output Power (dBm)					
Channel B No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz		Channel M No.400/425/450/475 2130/2131.25/ 2132.5/2133.75MHz		Channel T No .800/875/850/825 2153.75/2152.5/ 2151.25/2150 MHz	
Measured	Limit	Measured	Limit	Measured	Limit
49.47	< 62	49.41	< 62	49.32	< 62

(2) TM2: CDMA 1X EV-DO

(a) Single Carrier

table 19. Measurement Output Power for single carrier

Maximum Output Power (dBm)					
Channel B No.25 2111.25MHz		Channel M No.450 2132.5MHz		Channel T No .875 2153.75MHz	
Measured	Limit	Measured	Limit	Measured	Limit
43.13	< 62	43.40	< 62	43.23	< 62

(b) Two Carriers

table 20. Measurement Output Power for two carriers

Maximum Output Power (dBm)					
Channel B No.25/50 2111.25/2112.5MHz		Channel M No.450/475 2132.5/2133.75MHz		Channel T No .875/850 2153.75/2152.5MHz	
Measured	Limit	Measured	Limit	Measured	Limit
46.45	< 62	46.24	< 62	46.23	< 62

(c) Three Carriers

table 21. Measurement Output Power for three carriers

Maximum Output Power (dBm)					
Channel B No.25/50/75 2111.25/2112.5/ 2113.75MHz		Channel M No.425/450/475 2131.25/2132.5/ 2133.75MHz		Channel T No .875/850/825 2153.75/2152.5/ 2151.25MHz	
Measured	Limit	Measured	Limit	Measured	Limit
48.12	< 62	48.14	< 62	48.21	< 62

(d) Four Carriers

table 22. Measurement Output Power for four carriers

Maximum Output Power (dBm)					
Channel B No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz		Channel M No.400/425/450/475 2130/2131.25/ 2132.5/2133.75MHz		Channel T No.875/850/825/800 2153.75/2152.5/ 2151.25/2150 MHz	
Measured	Limit	Measured	Limit	Measured	Limit
49.41	< 62	49.53	< 62	49.56	< 62

6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

6.2 Modulation Characteristics

6.2.1 Test Conditions

table 23. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature (+15 °C to +35 °C):	19°C
Relative humidity (45 % to 85 %):	740 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Aws Band: B, M, T Multi Carriers: 1 TM1, TM2

6.2.2 Test Specifications and Limits

No specific modulation characteristics requirement limits in FCC part 2.1047 and part 27 subpart C & L for AWS Band. In addition, limits according to the technical requirements of the EUT can be adopted as showed in the following table.

table 24. Limits According to 3GPP2 C.S0010-B and C.S0032-0

Limits	Rho > 0.912 (for CDMA2000 1X) Rho > 0.97 (for CDMA 1X EV-DO)
--------	---

6.2.3 Test Method and Setup

The EUT (CRFU-AWS) was connected to the Wireless Signal Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Modulation Characteristics of the EUT by the R&S FSQ40.

For the CDMA2000 1X, the measurement was made based on two Radio Configurations: RC1 and RC3. The modulation mode of RC1 is BPSK, and the modulation mode of RC3 is QPSK. For the CDMA2000 1X EV-DO, the modulation mode is 16-QAM.

Test setup

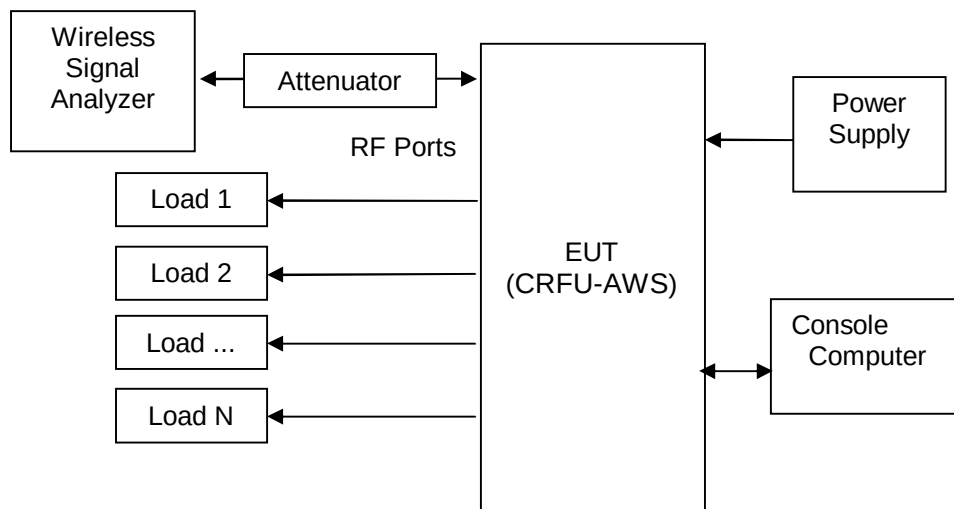


Figure 2. TEST SETUP

6.2.4 Measurement Results

(1) TM1: CDMA 1X

(a) RC1

table 25. Measurement Results for RC1

Modulation Characteristics				
Parameters Observed (Type/Mode)	channel	Measured	Limit	Remark
Rho(BPSK)	25	0.981	>0.912	See Appendix A
	450	0.979	>0.912	See Appendix A
	875	0.975	>0.912	See Appendix A

(b) RC3

table 26. Measurement Results for RC3

Parameters Observed (Type/Mode)	channel	Measured	Limit	Remark
Rho(QPSK)	25	0.991	>0.912	See Appendix A
	450	0.991	>0.912	See Appendix A
	875	0.988	>0.912	See Appendix A

(2) TM2: CDMA EVDO

table 27. Measurement Results for EVDO

Modulation Characteristics				
Parameters Observed (Type/Mode)	channel	Measured	Limit	Remark



Rho(16-QAM)	25	0.990	>0.97	See Appendix A
	450	0.994	>0.97	See Appendix A
	875	0.992	>0.97	See Appendix A

6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to Appendix A.

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature (+15 °C to +35 °C):	19°C
Relative humidity (45 % to 75 %):	74%
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	AWS Band: B, M, T Multi Carriers: 1 TM1, TM2,

6.3.2 Test Specifications and Limits

No specific occupied bandwidth requirement in FCC part 2.1049 and part 27 subpart C & L for AWS Band. Limits according to the technical requirements of the EUT can be adopted as showed in the following table.

table 28. Limits According to EUT technical requirements

Limits	< 1.48MHz
--------	-----------

6.3.3 Test Method and Setup

The EUT (CRFU-AWS) was connected to the Spectrum Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Occupied Bandwidth of the EUT by the R&S FSQ40.

Refer to 47CFR part2.1049 section (g) & (h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer's maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured (as 99% bandwidth).

Measurement bandwidth (RBW): 20 kHz
Video bandwidth (VBW): 200 kHz

Test setup

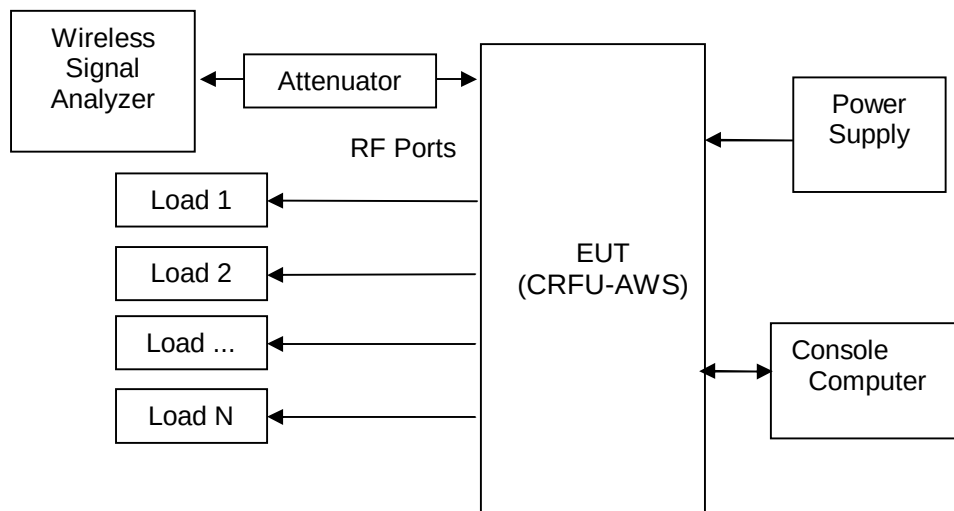


Figure 3. TEST SETUP

6.3.4 Measurement Results

(1) TM1: CDMA 1X

table 29. Measurement Results for CDMA 1X

Occupied Bandwidth (99% Bandwidth)					
Channel B No.25 2111.25MHz		Channel M No.450 2132.5MHz		Channel T No .875 2153.75MHz	
Measured	Limit	Measured	Limit	Measured	Limit
1.279	< 1.48	1.279	<1.48	1.279	< 1.48

(2) TM2: CDMA EVDO

table 30. Measurement Results for CDMA EVDO

Occupied Bandwidth (99% Bandwidth)					
Channel B No.25 2111.25MHz		Channel M No.450 2132.5MHz		Channel T No .875 2153.75MHz	
Measured	Limit	Measured	Limit	Measured	Limit
1.279	< 1.48	1.279	<1.48	1.279	< 1.48



6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to Appendix B.

6.4 Band Edges Compliance

6.4.1 Test Conditions

table 31. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature (+15 °C to +35 °C):	19 °C
Relative humidity (45 % to 85 %):	74 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	AWS Band: B, T Multi Carriers: 1, 4 TM1, TM2

6.4.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 27.53(g), in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, and the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

table 32. FCC Limits for AWS Band

Limit:	$< P[\text{Watt}] - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - (43 + 10 \log_{10} P) = 30 - 43 = -13 \text{ dBm}$
--------	--

6.4.3 Test Method and Setup

The EUT (CRFU-AWS) was connected to the Spectrum Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Band Edge Spurious Emissions of the EUT by the R&S FSQ40.

Set the Spectrum Analyzer or equivalent in power averaging mode and resolution bandwidth (RBW) as close to 1.0% of the emission bandwidth as possible. Set the sweep span to cover at least $\pm 250\%$ of the emission bandwidth or 2 MHz, which is larger.

Measurement bandwidth (RBW) of Spectrum Analyzer or equivalent:
for CDMA equipments 20 kHz (close to 1% of 1.25 MHz)

Test setup

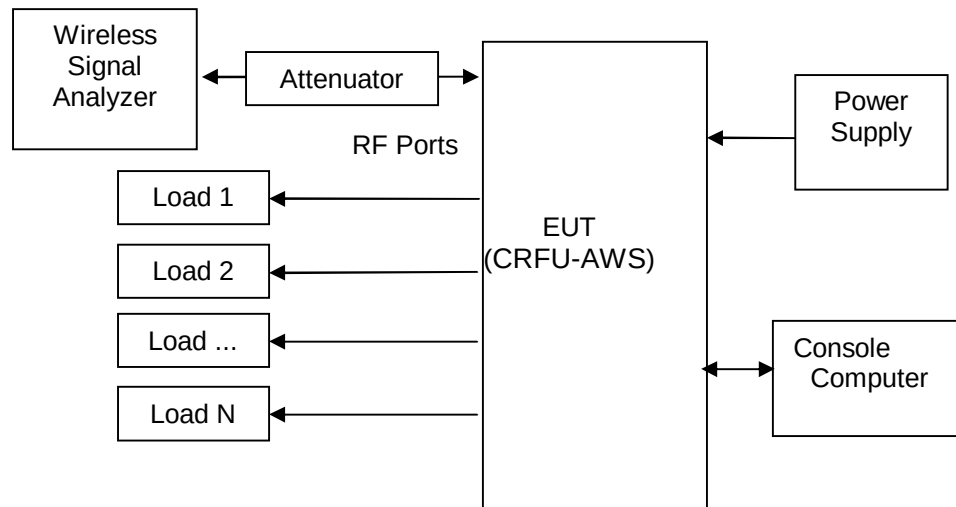


Figure 4. TEST SETUP

6.4.4 Measurement Results

(1) TM1: CDMA 1X

(a) Single Carrier

table 33. Measurement Results for 1X

	Channel No./Operating Frequency	Multi-Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25 2111.25MHz	1	2109 to 2110	-23.77	< -13	See Appendix C
T	No 875 2153.75MHz	1	2155 to 2156	-25.02	< -13	See Appendix C

(b) Multi Carriers

table 34. Measurement Results for 1X

	Channel No./Operating Frequency	Multi-Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz	4	2109 to 2110	-15.79	< -13	See Appendix C
T	No.875/850/825/800 2153.75/2152.5/ 2151.25/2150 MHz	4	2155 to 2156	-16.43	< -13	See Appendix C

(2) CDMA 1X EV-DO

a) Single Carrier

table 35. Measurement Results for EVDO

Channel No./Operating Frequency		Multi-Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25 2111.25MHz	1	2109 to 2110	-24.08	< -13	See Appendix C
T	No 875 2153.75MHz	1	2155 to 2156	-24.80	< -13	See Appendix C

(b) Multi Carriers

table 36. Measurement Results for EVDO

Channel No./Operating Frequency		Multi-Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz	4	2109 to 2110	-16.74	< -13	See Appendix C
T	No.875/850/825/800 2153.75/2152.5/ 2151.25/2150 MHz	4	2155 to 2156	-16.52	< -13	See Appendix C

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to Appendix C.

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

table 37. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature (+15 °C to +35 °C):	19°C
Relative humidity (45 % to 85 %):	74 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Aws Band: B, M, T Multi Carriers: 1, 4 TM1, TM2

6.5.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 27.53(g), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

table 38. FCC Limits for AWS Band

Limit:	$< P[\text{Watt}] - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - (43 + 10 \log_{10} P) = 30 - 43 = -13 \text{ dBm}$ (per MHz)
--------	---

6.5.3 Test Method and Setup

The EUT (CRFU-AWS) was connected to the Spectrum Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Out-band Spurious Emissions of the EUT by the R&S FSQ40.

For the Out-of-block Emissions:

Frequency Search Range:

According to FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) for 9 kHz to 10th harmonic included: 1MHz;

Alternatively, according to ITU SM.329-10,

Measurement bandwidth (RBW) for 9 kHz up to 150 KHz: 1 kHz;

Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;

Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;

Measurement bandwidth (RBW) for 1 GHz up to 22GHz harmonic included: 1 MHz;

Test setup

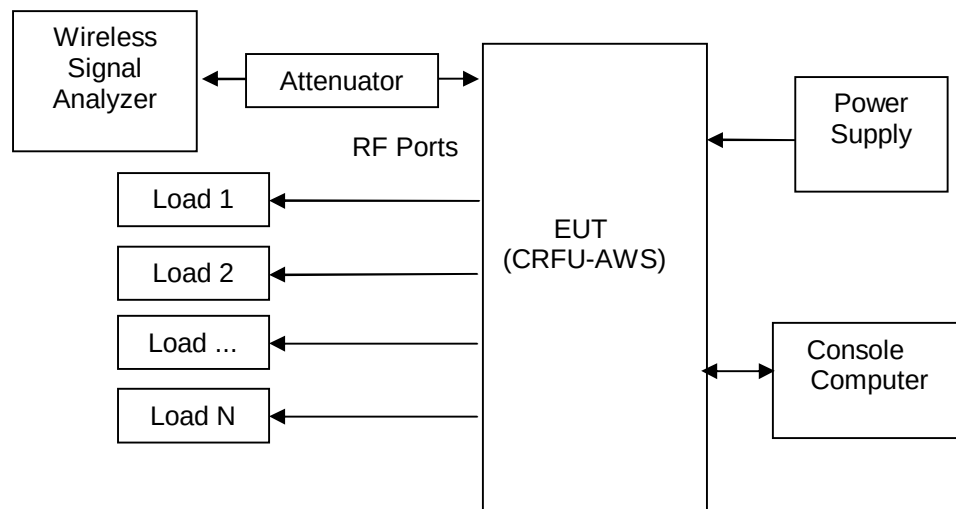


Figure 5. TEST SETUP

6.5.4 Measurement Results

6.5.4.1 Out-of-block Emissions Measurement

(1) CDMA 1X

Single Carrier

table 39. Measurement Results for CDMA 1X

Channel No./Operating Frequency	Multi-Carriers	Measured Frequency Range	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B No.25 2111.25MHz	1	9 kHz to 22 GHz	-23.01	< -13	See Appendix D
M No.450 2132.5MHz	1	9 kHz to 22 GHz	-22.77	< -13	See Appendix D
T No 875 2153.75MHz	1	9 kHz to 22 GHz	-22.51	< -13	See Appendix D

(b) Multi Carriers

table 40. Measurement Results for CDMA 1X

Channel No./Operating Frequency	Multi-Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz	4	9 kHz to 22 GHz	-22.99	< -13	See Appendix D

M	No.400/425/450/475 2130/2131.25/ 2132.5/2133.75MHz	4	9 kHz to 22 GHz	-22.06	< -13	See Appendix D
T	No.875/850/825/800 2153.75/2152.5/ 2151.25/2150MHz	4	9 kHz to 22 GHz	-22.82	< -13	See Appendix D

(2) CDMA 1X EV-DO

(a) Single Carrier

table 41. Measurement Results for CDMA EVDO

	Channel No./Operating Frequency	Multi- Carriers	Measured Frequency Range	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25 2111.25MHz	1	9 kHz to 22 GHz	-22.79	< -13	See Appendix D
M	No.450 2132.5MHz	1	9 kHz to 22 GHz	-22.77	< -13	See Appendix D
T	No 875 2153.75MHz	1	9 kHz to 22 GHz	-22.91	< -13	See Appendix D

(b) Multi Carriers

table 42. Measurement Results for CDMA EVDO

	Channel No./Operating Frequency	Multi- Carriers	Measured Frequency Range (MHz)	Max. Spurious Level Measured (dBm)	Limit (dBm)	Remark
B	No.25/50/75/100 2111.25/2112.5/ 2113.75/2115MHz	4	9 kHz to 22 GHz	-22.68	< -13	See Appendix D
M	No.400/425/450/475 2130/2131.25/ 2132.5/2133.75MHz	4	9 kHz to 22 GHz	-29.97	< -13	See Appendix D
T	No.875/850/825/800 2153.75/2152.5/ 2151.25/2150MHz	4	9 kHz to 22 GHz	-32.89	< -13	See Appendix D



6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to Appendix D.

6.6 Radiated Spurious Emission

6.6.1 Test Conditions

table 43. Test Conditions

Preconditioning:	1 hour
Measured at:	Enclosure
Ambient temperature (+15 °C to +35 °C):	22°C
Relative humidity (45 % to 85 %):	70 %
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Aws Band: M Multi Carriers: 1 TM1

6.6.2 Test Specifications and Limits

Compliance with FCC part 2.1051 and part 27.53(g), based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.

table 44. FCC Limits for AWS Band

Limit:	$< P[\text{Watt}] - (43 + 10 \log_{10} P) = 10 \log_{10}(1000P) - (43 + 10 \log_{10} P) = 30 - 43 = -13 \text{ dBm}$ (per MHz)
--------	---

6.6.3 Test Method and Setup

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 890 MHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

The EUT (CRFU-AWS) was equipped with non-integral antenna. And it should test according to part (b) of above section. The EUT was connected to match loads. The Console Computer controls the EUT to transmitter the maximum power which defined in specification of product. The EUT operated on a typical channel.

The test procedure

- (1) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, E.R.P. shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC part 2.1033(c)(8). The EUT/ CRFU-AWS was connected to ancillary in order to simulate normal operating conditions with reference to the guidance given in the standard for this type of equipment.
- (2) Test the radiated maximum output power by the test Receiver R&S ESMI received from test antenna.
- (3) Use substitution method to verify the Maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a Signal Generator. And then adjust the output level of the Signal Generator to get the same received power recorded in step (2) on the test Receiver R&S ESMI, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

Frequency Search Range:

According to FCC part 2.1057, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Measurement bandwidth (RBW) for 9 kHz to 10th harmonic included: 1MHz;

Alternatively, according to ITU SM.329-10,

Measurement bandwidth (RBW) for 9 kHz up to 150 KHz: 1 kHz;

Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;

Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;

Measurement bandwidth (RBW) for 1 GHz up to 10th harmonic included: 1 MHz;

Test setup

Step 1: Pre-test

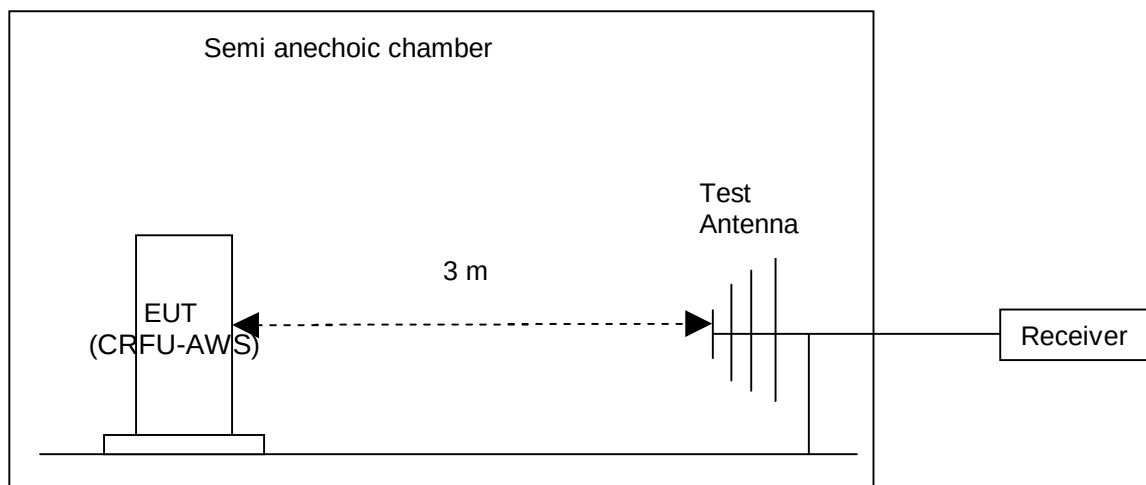


Figure 6. Test Set-up for Pre-test

Step 2: Substitution method to verify the maximum ERP

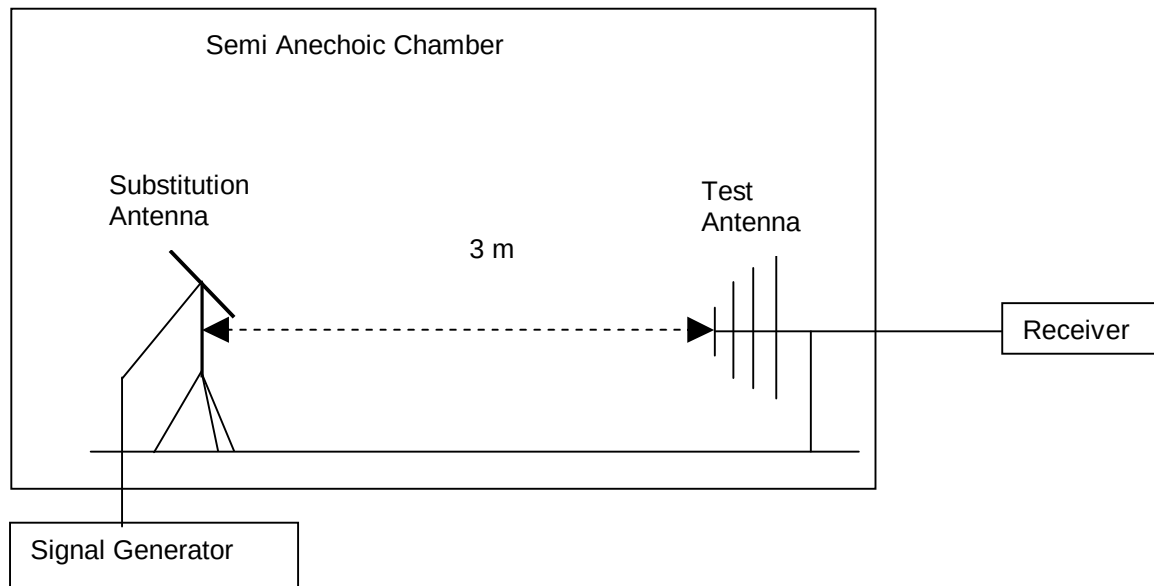


Figure 7. Test Set-up for Substitution

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

6.6.4 Measurement Results

6.6.4.1 Pre-test Measurement Results

table 45. Measurement Result

Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel450 2132.5MHz	30MHz ~12.75GHz	43	<- 13 dBm (See appendix E)	- 13 dBm	Pass

6.6.4.2 Substitution Results

table 46. Substitution Results

Freq. [MHz]	Measur ement Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result
/	/	/	/	/	/	/	/	/

Note: For get the EIRP. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level



6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to Appendix E.

6.7 Frequency Stability

6.7.1 Test Conditions

table 47. Test Conditions

Preconditioning:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity (45 % to 85 %):	46%
Air Pressure (86 kPa to 106 kPa):	101 kPa
Test Configuration/Mode:	Aws Band: at Channel M Multi Carriers: 1 under TM1

6.7.2 Test Specifications and Limits

Compliance with FCC part 2.1055 and part 27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

table 48. FCC Limits for AWS Band

Limit:	(not defended)
--------	----------------

In addition, limits according to the technical requirements of the EUT can be adopted as showed in the following table.

table 49. Limits According to EUT technical requirements

Limits for CDMA2000 equipments: (acc. to 3GPP2 C.S0010, C.S0032)	< ± 0.05 ppm
---	------------------

6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature from -30 °C to 50 °C. Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 °C through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the

equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

The test procedure

According to ANSI C63.4 clause 13.1.6, no modulation needs to be supplied to the intentional radiator during these tests, unless modulation is required to produce an output, e.g., single-sideband suppressed carrier transmitters.

The operating end points are: -48 VDC (normal point), -37 VDC (lowest point) and -60 VDC (highest point).

Test Set up

The EUT (CRFU-AWS) was connected to the Spectrum Analyzer or equivalent R&S FSQ40 via one RF connector, and other RF connectors were connected to match loads. The EUT was controlled to transmit maximum power by Console Computer. Measure and record the Frequency Tolerance of the EUT by the R&S FSQ40.

The EUT was placed inside an environmental temperature chamber.

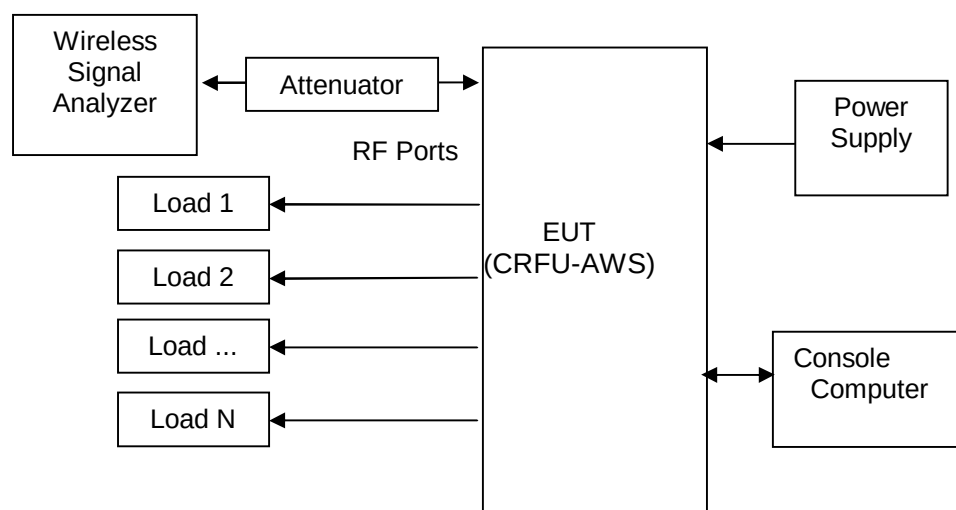


Figure 8. Test Set up

6.7.4 Measurement Results

6.7.4.1 Frequency Error vs. Temperature

table 50. Measurement Results for CDMA 1X

TEST CONDITIONS		Frequency Stability Middle Channel:450 Frequency :2132.5MHz		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
V _{nom} (-48 VDC)	-30 °C	-6	-0.01	< ±0.05
	-20 °C	22	0.01	< ±0.05

	-10 °C	-36	-0.02	< ±0.05
	0 °C	-2	-0.01	< ±0.05
	+10 °C	3	0.01	< ±0.05
	+20 °C	7	0.01	< ±0.05
	+30 °C	3	0.01	< ±0.05
	+40 °C	5	0.01	< ±0.05
	+50 °C	-4	-0.01	< ±0.05

6.7.4.2 Frequency Error vs. Voltage

table 51. Measurement Results for CDMA 1X

TEST CONDITIONS		Frequency Stability Middle Channel:450 Frequency :2132.5MHz		
		Measured Max. Frequency Error		Limit (ppm)
		Hz	ppm	
T _{nom} (23°C)	85%V _{nom} (-37 VDC)	-4	-0.01	< ±0.05
	100%V _{nom} (-48 VDC)	-5	-0.01	< ±0.05
	115%V _{nom} (-60 VDC)	-11	-0.01	< ±0.05

6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.

7 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

table 52. System Measurement Uncertainty

Items		Extended Uncertainty
Band Width	Magnitude (%)	U=0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U=2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U=2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U=0.21ppm; k=2
Field Strength of Spurious Radiation	ERP (dBm)(30MHz~1G)	U=4.6dB; k=2
	ERP (dBm) (>1G)	U=3dB; k=2
Conducted Output Power	Power (dBm)	U=0.39dB; k=2



8 Appendices

Appendix A	Measurement Results Modulation Characteristics	10	Pages
Appendix B	Measurement Results Occupied Bandwidth	7	Pages
Appendix C	Measurement Results Band Edges	9	Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	49	Pages
Appendix E	Measurement Results Radiated Spurious Emission	4	Pages
Appendix F	Photos of Test Setup	4	Pages

----- END OF REPORT -----